

**SUBSTRATE TREATMENT APPARATUS**

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Equivalents:

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**Abstract**

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**PROBLEM TO BE SOLVED:** To provide a small substrate treatment apparatus with uniformity in treatment, regardless of the positions in a batch-treatment container, and no damage due to the rotation or in-face uniformity in treatment of a large-size wafer in a single wafer treatment container, while strains such as watermarks or damages in rotation are prevented.

**SOLUTION:** A substrate treatment apparatus includes a substrate treatment container 2, made up of an upper cover 5 for opening and closing tightly and a container member 23, and a substrate holding member 4 for holding a wafer 3 in the container member 23. In a controlling means 7, valve members 71 to 77, and 79, driving members 22 and 42, and a reducing pressure pump 78 are controlled by a control unit 80 to feed and/or drain a treatment solution and/or gas in the container member 23. In this way a chemical treatment, a washing treatment, and a drying treatment are sequentially carried out. A wafer 3 is immersed in the small sealed substrate treatment container 2, and the face of the wafer 3 is processed in various kinds of treatments.

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**Bibliography.**

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**Summary.**

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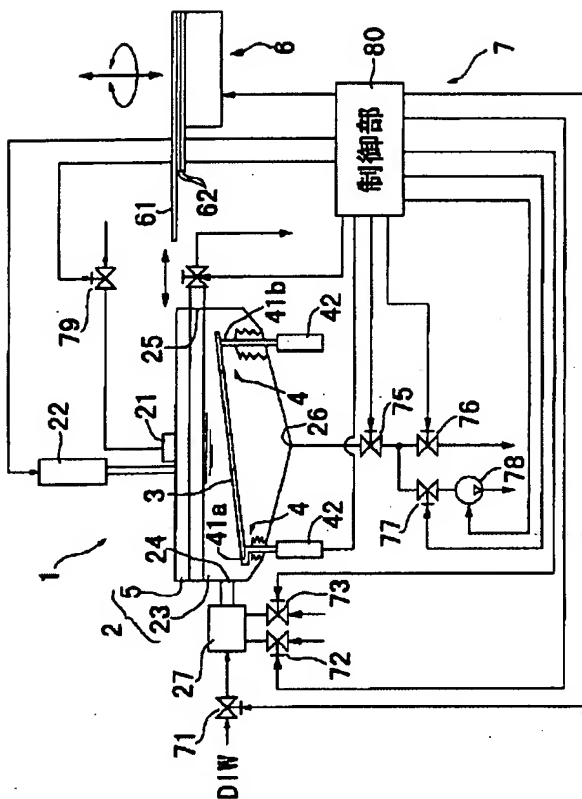
(57) [Abstract]

[Technical problem] While suppressing generating of the watermark (silverfish) which miniaturized the size of equipment itself while canceling the position dependency in a tub of the processing homogeneity conventionally produced with the equipment for batch processing, and had been conventionally produced with the substrate processor for sheet processing and holding the homogeneity on the front face of a substrate, it is made to correspond to enlargement of substrate size without damage by rotation.

[Means for Solution] the top cover 5 in which opening or sealing of the interior is free, and a tub -- the substrate processing tub 2 which consists of a member 23 77, 79, driving member 22 and 42, and the reduced pressure pump 78 are controlled by the control section 80. this tub -- the substrate attaching part 4 which can hold a wafer 3 within a member 23, and a bulb -- member 71-- a tub -- processing liquid or/, and a raw gas by supply or/, and discharging in a member 23 It has the control means 7 controlled to perform dryness processing to medical fluid processing and a rinsing processing pan one by one, and one wafer 3 is immersed into the processing liquid in the sealed small substrate processing tub 2, and various processings are performed to the front face.

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CLAIMS

[Claim(s)]

[Claim 1] the substrate processor which can process a substrate front face where a substrate is held inside -- setting -- the outline member in which opening or sealing of the interior is free, and this outline -- a member -- the substrate attaching part which can hold a substrate inside, and the aforementioned outline -- a member -- the substrate processor characterized by having supply or/, and the control means

controlled to discharge for processing liquid or/, and a raw gas inside

[Claim 2] The substrate processor which can process a substrate front face where [ which is characterized by providing the following ] a substrate is held inside. the outline in which opening or sealing of the interior is free -- a member this outline -- a member -- it arranges inside -- having -- the depot which can store processing liquid. It is the substrate attaching part which can be held in a longitudinal direction about a substrate within this depot. supply of the processing liquid into the effluent tub which receives the processing liquid overflowed from the aforementioned depot, and the aforementioned depot, and the aforementioned outline -- a member -- the control means which control the effluent out of supply of the raw gas inside, the aforementioned depot, or/and an effluent tub, or exhaust air

[Claim 3] The aforementioned substrate attaching part is level or a substrate processor according to claim 1 or 2 characterized by having the supporter material supported with an inclination posture, and the driving member which moves this supporter material to the vertical position the inside of processing liquid, and besides processing liquid about the aforementioned substrate.

[Claim 4] The aforementioned supporter material is a substrate processor given in any of the claim 3 characterized by having made the substrate incline and considering as the composition which can be supported so that a processing liquid supply side may become low they are.

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the substrate processor which supplies processing liquid, a raw gas, etc. to the processed substrate (only henceforth a substrate) of the shape of sheet metal, such as a semiconductor wafer and a glass substrate for liquid crystal display panels, and performs

predetermined surface treatment to a substrate.

[0002]

[Description of the Prior Art] Conventionally, the substrate processor which forms a thin film on substrates, such as a semiconductor wafer and a glass substrate for liquid crystal displays, or carries out washing etching of the substrate is offered as one of the equipment for manufacturing a semiconductor device and a liquid crystal display. In this substrate processor, the processing section which performs the processing section which forms a thin film, and substrate washing being prepared, and conveying a processed substrate among these processing sections by the substrate transport device, processing liquid is supplied to a substrate in each processing section, and surface treatment of a substrate is performed.

[0003] For example, in the case of the substrate processor of the multi-tub type for batch processing, in two or more processing tubs, two or more substrates are simultaneously conveyed by the substrate transport device, and pure water washing processing is performed to a medical fluid processing pan because you make it immersed in processing liquid, and finally, the spin dryer, the IPA vapor dryer, etc. are performing dryness processing one by one.

[0004] Moreover, in the case of the substrate processor of the single tub type for batch processing, one tub is performing pure water washing processing to the medical fluid processing pan one by one by conveying two or more substrates by the substrate transport device simultaneously, and making them immersed in processing liquid.

[0005] On the other hand, in the case of the substrate processor for sheet processing, it conveys one substrate at a time by the substrate transport device, for example, etching and washing processing are performed by the spray and rotation processing, after that, it rotation for the first time in cuts, or the air knife is performing dryness processing.

[0006]

[Problem(s) to be Solved by the Invention] however, in the substrate processor of the multi-tub type for the above-mentioned conventional batch processing, and a single tub type The substrate located in the middle when making two or more substrates arranged so that a substrate side might counter mutually immersed in the processing liquid currently overflowed, for example, performing etching, washing processing, etc., By the substrate located in ends, such as a near-side side or a back side, since the flows of processing liquid differed, variation arose, for example in etching, washing processing, etc., and it had the problem that the position dependency in a tub of processing homogeneity occurred. This homogeneous position dependency in a tub appears so notably that the wafer as a substrate becomes a diameter of macrostomia as it was called the aperture of 300mm. Moreover, in order to process two or more substrates simultaneously, in the substrate processor for batch processing, the size of equipment itself also became large with the size of the tub, and it had the problem

that a lot of processing liquid, such as a medical fluid and pure water, was needed. Furthermore, a big tub is independently needed also about reduced pressure drying in this case.

[0007] Moreover, in the substrate processor for the above-mentioned conventional sheet processing, in order to convey one substrate at a time, for example, to perform spray rotation washing processing etc., when the front face of a substrate was exposed to the atmosphere with moisture during various processings of a substrate, it had the problem that the homogeneity on front faces of a substrate, such as generating of the watermark (silverfish) resulting from growth of a surface natural oxidation film etc. and generating of the particle according to it further, was spoiled. It is the factor which this natural oxidation film has unstable resistance, for example, reduces the yield in manufacture of a semiconductor device etc. Moreover, in the substrate processor for sheet processing, the load of the substrate by rotation itself and the mechanism section became large, and it had the problem that substrate size was not greatly made from a viewpoint of those injury prevention, so that substrate sizes, such as aperture of a wafer, became large, in order to rotate one substrate at a time and to perform various processings.

[0008] this invention solves the above-mentioned conventional problem, and while canceling the position dependency in a tub of the etch uniformity conventionally produced with the equipment for batch processing, the size of equipment itself is miniaturized. Moreover, while suppressing generating of the watermark (silverfish) conventionally produced with the substrate processor for sheet processing and holding the homogeneity on the front face of a substrate, it aims at offering the substrate processor which can be made to correspond to enlargement of substrate size easily without the injury by rotation.

[0009]

[Means for Solving the Problem] the substrate processor with which the substrate processor of this invention can process a substrate front face where a substrate is held inside -- setting -- the outline member in which opening or sealing of the interior is free, and this outline -- a member -- the substrate attaching part which can hold a substrate inside, and an outline -- a member -- it is characterized by having supply or/, and the control means controlled to discharge for processing liquid or/, and a raw gas inside

[0010] the outline sealed by this composition -- a member, since various processings are performed to a substrate front face in the state where one substrate was made immersed into processing liquid inside While the homogeneous position dependency in a tub of the processing conventionally produced with the equipment for batch processing is canceled Generating of the watermark (silverfish) conventionally produced with the substrate processor for sheet processing is suppressed, the homogeneity on the front face of a substrate is held, and it becomes possible to make it correspond to enlargement of substrate size without the injury by rotation like

before. Moreover, since an outline member is [ containing one substrate ] only small, while attaining miniaturization and \*\* space-ization, it becomes still more possible \*\*\*\*\* liquefaction and to also attain shortening of the processing time, and low-cost-ization is attained.

[0011] Moreover, the substrate processor of this invention is set to the substrate processor which can process a substrate front face where a substrate is held inside. It is arranged inside the outline member in which opening or sealing of the interior is free, and this outline -- a member -- with the depot which can store processing liquid. The effluent tub which receives the processing liquid which overflowed the substrate from the depot within this depot with the substrate attaching part which can be held in a longitudinal direction, supply of the processing liquid into a depot, and an outline -- a member -- it is characterized by having the control means which control the effluent out of supply of the raw gas inside, a depot, or/and an effluent tub, or exhaust air.

[0012] this composition -- the above-mentioned operation -- in addition, an outline -- a member -- inside. Since the depot which holds a substrate, and the effluent tub which receives the processing liquid overflowed from this depot are prepared while storing processing liquid. In pure water washing processing etc., the medical fluid which adhered to the substrate at the time of medical fluid processing, and the matter (particle) generated by medical fluid processing for example, with pure water an effluent tub -- minding -- an outline -- a member -- while becoming possible to begin to pass smoothly outside and suppressing the bad influence to a substrate front face further, it is suppressed further, and growth of a natural oxidation film etc. is suppressed further and the contact to the atmosphere on the front face of a substrate also becomes maintainable [ a substrate front face / the further homogeneity ]

[0013] Furthermore, the substrate attaching part in the substrate processor of this invention is preferably characterized for a substrate by level or having the supporter material supported with an inclination posture, and the driving member which moves this supporter material to the vertical position the inside of processing liquid, and besides processing liquid.

[0014] Since it can move to the lower position in processing liquid, and the upper position besides processing liquid freely by driving member after the substrate attaching part has held the substrate in the longitudinal direction by supporter material by this composition, a substrate is made to flood with processing liquid in the lower position, predetermined processing is performed, and it succeeds in delivery of a substrate easily in an upper position.

[0015] Furthermore, preferably, the supporter material in the substrate processor of this invention is characterized by having made the substrate incline and considering as the composition which can be supported so that a processing liquid supply side may become low.



[0016] Since a substrate inclines in a longitudinal direction and is supported by this composition at it so that a processing liquid supply side may become low, although it makes a lateral substrate immersed in processing liquid or takes out from the inside of processing liquid. While suppressing the liquid remainder on bending and the substrate front face of a substrate and making a liquid piece good at this time, the position dependency in a tub of the processing homogeneity conventionally produced with the equipment for batch processing because the supplied processing liquid makes it easy to flow in the whole substrate front face may be canceled more certainly.

[0017]

[Embodiments of the Invention] Although the operation gestalt of the substrate processor concerning this invention is hereafter explained with reference to a drawing, this invention is not limited to the operation gestalt shown below.

[0018] Drawing 1 is the \*\* type view showing the outline composition of the substrate processor of 1 operation gestalt of this invention.

[0019] In drawing 1, while the substrate processor 1 holds the wafer 3 as a substrate within the substrate processing tub 2 as an outline member in which opening or sealing of the interior is free, and this substrate processing tub 2. The substrate attachment component [in the state where the wafer 3 was held] 4 which can vertically move a wafer 3, While controlling the carrier robots 6 which carry out the feeding and discarding of the wafer 3 to the substrate processing tub 2 at the time of opening of the top cover 5 of this substrate processing tub 2, and these substrate attachment components 4 and carrier robots 6 and making a wafer 3 transfer. It has the control means 7 which control processing liquid or/, and a raw gas in the substrate processing tub 2 to perform dryness processing to various kinds of medical fluid processings and a rinsing processing one by one on the front face of a wafer 3 in supply or/, and the sealing state that discharged and held the wafer 3 in the interior.

[0020] The raw-gas feed hopper 21 to which this substrate processing tub 2 can supply nitrogen gas and an IPA (isopropyl alcohol) steam freely, The driving member 22 which a point is attached [driving member] in the outer wall proper place of the top cover 5 by which this raw-gas feed hopper 21 was arranged in the center section, and this top cover 5, and carries out vertical movement of the top cover 5, such as a solenoid for opening and closing, and a cylinder, While the interior can open freely by carrying out vertical movement of the top cover 5 by this driving member 22 the sealant which is not illustrated -- a top cover 5 -- putting -- the tub which can be sealed freely -- with a member 23 this tub -- it being arranged by the side-attachment-wall lower part of a member 23, and with the processing liquid feed hopper 24 which supplies processing liquid, such as a medical fluid and pure water, in a tub the tub in which this processing liquid feed hopper 24 was arranged -- with the overflow effluent mouth 25 which is arranged in the side-attachment-wall upper part of an opposite side, is made to overflow the processing liquid supplied in the tub from

the processing liquid feed hopper 24, and carries out an effluent to the side attachment wall of a member 23 a tub -- it arranges in the bottom wall center section of the member 23 -- having -- \*\*\*\* -- a tub -- or it carries out the rapid effluent of the processing liquid in a member 23 -- or a tub -- it has the exhaust port 26 which exhausts and decompresses the gas in a member 23 Thus, as for the substrate processing tub 2, the wafer 3 as a substrate is the small sealing chamber of the DIP formula in which one-sheet hold in a longitudinal direction is possible, with the miniaturization of equipment size, early, medical fluid substitution can be performed early and reduced pressure attainment can also raise [ substitution ] a throughput now.

[0021] Moreover, as for the substrate attachment component 4, the processing liquid feed-hopper 24 side becomes low. The supporter material 41a and 41b which supports the edge of a wafer 2 while two or more support (two places are supported with this operation gestalt) receives the edge portion of the rear face of a wafer 3 from a lower part in the state where the wafer 3 was made to incline in a longitudinal direction so that the overflow effluent mouth 25 side may become high, Each point is attached in these supporter material 41a and 41b, respectively, and it has each driving member 42, such as a cylinder which carries out vertical movement of these supporter material 41a and 41b, respectively between the lower position in processing liquid, and the upper position on processing liquid. This supporter material 41a is supported by the line contact along with the edge portion by the side of the 1 subordinate of a wafer 3, supporter material 41b is supporting the upper edge portion by the point contact, and these supporter material 41a and 41b consists of only rear-face edge contact of a wafer 3 so that the portion which cannot be washed to the front-face side of a wafer 3 may not occur.

[0022] Moreover, making a longitudinal direction incline and holding one wafer 3 in this way The processing liquid which holds so that the front face of a wafer 3 may be suitable in accordance with the flow of processing liquid, and is supplied from the processing liquid feed hopper 24 By receiving by the whole front-face side of a wafer 2, making it overflow smoothly from the overflow effluent mouth 25, and carrying out an effluent two or more sheets conventional DIP formulas, while making it the position dependency in a tub of etch uniformity [ like ] not occur When moving a wafer 3 to the upper position on processing liquid, it has good composition of a liquid piece so that a load may not be applied as much as possible to a wafer 3, but a wafer 3 may bend and processing liquid may not collect. a relation with the processing volume made to store although the degree of tilt angle of the wafer 2 in this case needs to select the good angle of the liquid piece of a grade to which the processing liquid of the front face of a wafer 3 flows and falls from the front face of a wafer 3 easily, without substrates, such as a wafer 2, bending -- a tub -- a member 23 has the shallower good one

[0023] moreover, a tub -- in the arrangement position of the substrate attachment

component 4 of the bottom wall portion of a member 23. A part for the center section of a bellows-like member is arranged free [ vertical movement ] so that it may be in a sealing state about the inside of a member 23. the bellows-like member which consists of elastic bodies, such as a fluororesin, -- a tub -- Both the driving member 42 constitutes between the lower position in processing liquid, and the upper positions on processing liquid for the wafer 3 from the inclination posture respectively free [ vertical movement ] with the supporter material 41a and 41b. Although a wafer 3 is further made into a horizontal position from the upper position on this processing liquid, and delivery by the carrier robot 6 consists of these operation gestalten at the time of the feeding and discarding of a wafer 3 so that easily, it is needless to say that delivery by the carrier robot 6 can be performed with the inclination posture of the wafer 3 of the upper position on processing liquid.

[0024] furthermore, the hand whose carrier robot 6 supports a wafer 3 from a lower part -- with a member 61 this hand -- up to the wafer 3 bottom which was connected with the point of a member 61 at the end section of an opposite side, and was held by the substrate attachment component 4 in the upper position -- a hand -- a member 61 being lengthened or the arm its drawn in from the wafer 3 bottom held by the substrate attachment component 4 in the upper position to the predetermined position of drawing 1 -- a member 62 -- having -- \*\*\*\* -- these hands -- a member 61 and an arm -- both the members 62 by making it move upward A receipt is possible in the substrate attachment component 4 to the wafer 3 by laying on a member 61 and raising. the wafer 3 held by the substrate attachment component 4 -- a hand -- moreover, a hand -- the state where the wafer 3 was laid on the member 61 -- a hand -- a member 61 and an arm, by moving a member 62 downward with a wafer 3, the wafer 3 could be made to be able to lay on the substrate attachment component 4, the wafer 3 could be supplied on the substrate attachment component 4, and it has come this hand -- although the member 61 is not illustrated -- some circular wafers 3 -- the shape of two forks which met the edge -- carrying out -- \*\*\*\* -- the hand of the shape of this fork -- a suction slot (not shown) forms in a member 61 -- having -- this suction slot -- the part by the side of the rear face of a wafer 3 -- an edge portion is attracted and a wafer 3 is fixed at the time of conveyance

[0025] moreover, the carrier robot 6 -- the hand from the supporter material 41a and 41b of the substrate attachment component 4, after receiving a wafer 3 by the member 61 a hand -- a member 61 and an arm -- rotating a wafer 3 with a member 62, or it being made to move, or It is possible to convey the wafer [ finishing / washing processing ] 3 at the following process, or to hold the wafer / finishing / washing processing ] 3 temporarily in the carrier (not shown) which can hold two or more wafers 3 etc. moreover -- that a carrier robot 6 conveys a wafer 3 from a last process \*\*\*\* -- the wafer 3 in a carrier (not shown) -- a hand -- after receiving by the member 61 -- a hand -- a member 61 and an arm -- a wafer 3 is rotated with a

member 62, or it is possible to make it move, and the wafer 3 could be supplied on the substrate attachment component 4, and it has come

[0026] furthermore, mixing to which control means 7 were connected with the processing liquid feed hopper 24 -- the bulb for pure water flow control currently arranged in the middle of piping connected through the member 27 -- with a member 71 this mixing -- the bulb for the 1st medical fluid flow control currently arranged in the middle of piping for the medical fluids connected through the member 27 -- with a member 72 mixing -- the bulb for the 2nd medical fluid flow control currently arranged in the middle of another piping for medical fluids connected through the member 27 -- with a member 73 the bulb for effluent flow control currently arranged in the middle of piping connected with the overflow effluent mouth 25 -- with a member 74 the bulb for effluent flow control currently arranged in the middle of piping connected with the exhaust port 26 -- with members 75 and 76 these bulbs -- the bulb for exhaust air flow control currently arranged in the middle of piping which branched from the connection section of members 75 and 76 -- with a member 77 and the reduced pressure pump 78 the bulb for raw-gas supply-flow-rate adjustment currently arranged in the middle of piping connected with the raw-gas feed hopper 21 -- with a member 79 these bulbs -- member 71- it connecting with 77, 79 and the reduced pressure pump 78, each driving member 22 and 42, and each control terminal of a carrier robot 6, respectively, and by controlling these sequentially The processing liquid or the raw gas of the various kinds [ wafer / 3 ] in the state where held the wafer 3 in the interior of the substrate processing tub 2, and it was sealed is supplied, or it has the control section 80 controlled an effluent or by exhausting to perform dryness processing to medical fluid processing and a rinsing processing pan one by one. In addition, it is things needless to say that you may be various medical fluid processings, such as nitride removal processing, resist ablation processing, oxide-film etching processing, and washing processing before diffusion, besides the light etching processing shown with this operation gestalt as medical fluid processing in a series of various above-mentioned substrate processings.

[0027] This control section 80 consists of a sequencer, a microcomputer, etc., and one by one, it succeeds in control of each part material, and succeeds in a series of substrate conveyance processing and various substrate processings automatically.

[0028] The above-mentioned composition explains the operation below. The \*\* type view showing the important section composition of a wafer feeding-and-discarding state [ in / the substrate processor of drawing 1 / in drawing 2 ], the \*\* type view showing the important section composition of the wafer pressure-from-below state in front of a rapid effluent / in / the substrate processor of drawing 1 / in drawing 3 ], and drawing 4 are the \*\* type views showing the important section composition of the state at the time of the reduced pressure drying in the substrate processor of drawing 1 .

[0029] First, as shown in drawing 2 , moving \*\*\*\* of the wafer [ finishing / washing

processing ] 3 and the wafer 3 which should be washed is performed.

[0030] that is, the control section 80 -- driving member 22 -- above -- move control -- carrying out -- a tub -- a member 23 -- receiving -- a top cover 5 -- opening wide -- each driving member 42 -- above -- move control -- carrying out -- a wafer 3 -- a tub -- in the state where it came out from the member 23 to the upper part, move control of the wafer 3 is carried out so that it may become a horizontal position. It is drawing in, while moving a member 61 upward. then, the control section 80 -- a hand -- a member 61 and an arm -- a member 62 -- extension control -- carrying out -- a hand -- a member 61 is located under the wafer 3 -- making -- a hand -- the wafer 3 supported by each supporter material 41a and 41b -- a hand -- a member 61 top -- moving -- changing -- further -- a hand -- a member 61 and an arm -- a member 62 is performed for shortening control, rotation control, etc., for example, the wafer [ finishing / washing-processing ] 3 is conveyed and held in the carrier for interim storage (not shown) etc.

[0031] It receives on a member 61. moreover, the wafer 3 out of another carrier (not shown) with which a control section 80 controls a carrier robot 6, and two or more wafers 3 for washing are held -- a hand -- Extension control of the member 62 is carried out. the hand -- the state where the wafer 3 which should be washed on a member 61 was laid -- a hand -- a member 61 and an arm -- a hand -- a wafer 3 is located above each supporter material 41a and 41b with a member 61 -- making -- a hand -- stopping suction, while moving a wafer 3 downward with a member 61 -- a wafer 3 -- a hand -- it moves from on a member 61 on each supporter material 41a and 41b, and changes

[0032] this time -- a control section 80 -- a bulb -- members 71 and 74 -- opening control -- carrying out -- a tub -- supplying so that pure water can be overflowed in a member 23 -- a tub -- the inside of a member 23 is filled with pure water in addition, other bulbs -- members 72, 73, 75, and 79 are made the stoppage state by the control section 80

[0033] Next, as shown in drawing 1 , a wafer 3 is held in the interior in the state of being immersed, the substrate processing tub 2 is made into a sealing state, and pure water washing processing is performed to a medical fluid processing pan.

[0034] That is, a control section 80 is in the state which laid the wafer 3 on each supporter material 41a and 41b. each driving member 42 -- down -- move control -- carrying out -- a tub -- the seal member which carries out move control of the driving member 22 further down by locating a longitudinal direction with a predetermined inclination posture in the pure water in a member 23, and is not illustrated -- minding -- a tub -- the interior is made into a sealing state as it puts by the member 23 and the top cover 5 this time -- a tub -- the pure water in a member 23 is supplied from the processing liquid feed hopper 24, and the effluent is overflowed and carried out from the overflow effluent mouth 25 of the opposite side

[0035] Open control of the member 72 is carried out. this state -- the bulb for the

1st medical fluid flow control in a control section 80 -- the 1st medical fluid (for example, the case of light etching HF) -- mixing -- a member 27 -- minding -- the tub from the processing liquid feed hopper 24 -- because are supplied in a member 23 where predetermined concentration is mixed with pure water, and this overflows a tub -- the inside of a member 23 is replaced by the 1st medical fluid of predetermined concentration, and it succeeds in medical fluid processing of a wafer 3 a predetermined time of after -- the bulb for the 1st medical fluid flow control in a control section 80 -- a member 72 -- stoppage control -- carrying out -- the pure water from the processing liquid feed hopper 24 -- a tub -- it being supplied in a member 23 and making it overflow -- it is -- a tub -- the inside of a member 23 is replaced by pure water, and it succeeds in pure water washing processing of a wafer 3 this time -- pure water -- a tub -- the medical fluid which adhered to the wafer 3 by making it overflow from a member 23 at the time of medical fluid processing, and the matter (particle) generated by medical fluid processing -- pure water -- a tub -- it begins to pass through the overflow effluent mouth 25 out of a member 23 After a predetermined time, each process of pure water washing processing is repeated the number of predetermined times to a medical fluid processing pan like the above, and medical fluid processing and pure water rinsing processing are ended.

[0036] Then, reduced-pressure-drying processing is performed through wafer pressure-from-below operation before a rapid effluent, and ejection of the wafer [ finishing / washing processing ] 3 is performed.

[0037] that is, the state which carried out move control of each driving member 42 of both above, and laid the wafer 3 with the inclination posture on each supporter material 41a and 41b in order that a control section 80 might suppress the load to the wafer 3 at the time of a rapid effluent -- it is -- a tub, although you make it located on the pure water oil level in a member 23 this time -- a bulb -- a member 79 carries out opening control -- having -- the inside of the substrate processing tub 2 of the raw-gas feed hopper 21 to a sealing state -- as [ expose / into the atmosphere / the front face of a wafer 3 / the raw gas for dryness of hot nitrogen gas, an IPA (isopropyl alcohol) steam, etc. is supplied, and / for example, ] and the control section 80 -- a bulb -- members 75 and 76 -- both -- opening control -- carrying out -- the tub from an exhaust port 26 -- the rapid effluent of pure water, a contamination, etc. in a member 23 is carried out this time -- a control section 80 -- other bulbs -- member 71- 74 and 77 are in the sealing state by which stoppage control was carried out, the inside of the substrate processing tub 2 is filled with the raw gas which consists of hot nitrogen gas and hot IPA (isopropyl alcohol) gas, and the moisture of the front face of a wafer 3 is exposed and replaced by IPA gas furthermore, the control section 80 -- a bulb -- a member 76 -- stoppage control -- carrying out -- a bulb -- while carrying out opening control of the member 77 -- the reduced pressure pump 78 -- driving -- the tub from an exhaust port 26 -- the rapid exhaust air of the gas atmosphere in a member 23 is carried out, and it succeeds in IPA dryness

processing by making the inside of the substrate processing tub 2 into a reduced pressure state this time -- a control section 80 -- a bulb -- stoppage control of the member 79 is carried out

[0038] furthermore, a predetermined time of after and a control section 80 -- a bulb -- while carrying out opening control of the member 79, carrying out an elevated-temperature nitrogen purge and returning the interior to atmospheric pressure -- a bulb -- the inside of the substrate processing tub 2 is made into a sealing state by carrying out stoppage control of the members 71-77 altogether In order to make it whether the front face of a wafer 3 is made, and not exposed into the atmosphere, you may make it make it stand by till the stage to convey the wafer [ finishing / washing processing ] 3 at the following process in this state.

[0039] Then, it will be taken out as the wafer [ finishing / washing processing ] 3 described above from the inside of the substrate processing tub 2, and the wafer 3 which should newly be washed will be set in the substrate processing tub 2.

[0040] as mentioned above, the top cover 5 in which opening or sealing of the interior is free and a tub -- with the substrate processing tub 2 which consists of a member 23 77, 79, driving member 22 and 42, and the reduced pressure pump 78 are controlled by the control section 80. this tub -- the substrate attaching part 4 which can hold a wafer 3 within a member 23, and a bulb -- member 71- a tub -- processing liquid or/, and a raw gas by supply or/, and discharging in a member 23 It has the control means 7 controlled to perform dryness processing to medical fluid processing and a rinsing processing pan one by one, and one wafer 3 is immersed into the processing liquid in the sealed small substrate processing tub 2, and various processings are performed to the front face.

[0041] For this reason, while the position dependency in a tub of the etch uniformity conventionally produced with the equipment for batch processing processed simultaneously two or more sheets is cancelable, generating of the watermark (silverfish) conventionally produced with the substrate processor for sheet processing can be suppressed, and the homogeneity on the front face of a substrate can be held, and it can respond to enlargement of substrate size without the injury by rotation. Moreover, since a wafer 3 is the small chamber which enters only one sheet in the substrate processing tub 2, while being able to attain miniaturization and \*\* space-ization, \*\*\*\*\* liquefaction, and also medical fluid substitution and reduced pressure attainment can attain shortening of the processing time early, a throughput can improve and low-cost-ization can be attained. Thus, since it is a small tub (chamber), the miniaturization of equipment size is possible, and if two or more the small tubs (chamber) are prepared, improvement in the further throughput will also be attained.

[0042] Moreover, since the substrate attaching part 4 can move a wafer 3 to the lower position in processing liquid, and the upper position besides processing liquid freely in the state where it held in the longitudinal direction, a wafer 3 can be made to be able to flood with processing liquid in the lower position, predetermined processing

can be performed, and a wafer 3 can be delivered easily in an upper position. Moreover, since the wafer 3 as a substrate is held with the inclination posture at the time of this predetermined processing so that a processing liquid supply side may become low, When making the lateral wafer 3 immersed in processing liquid or taking it out from the inside of processing liquid, while being able to suppress the liquid remainder bending of a wafer 3 and on it and being able to make a liquid piece good The position dependency in a tub of the etch uniformity conventionally produced with the equipment for batch processing processed simultaneously two or more sheets can be more certainly canceled because the supplied processing liquid flows in abbreviation homogeneity on the whole front face of a wafer 3 reasonable.

[0043] Furthermore, if the nitrogen purge of the inside of the substrate processing tub 2 is carried out and various processings are performed, the problems that the front face was not exposed to the atmosphere and it originated in growth of a surface natural oxidation film like before and it during the period when the wafer 3 held in the substrate processing tub 2 is processed within the substrate processing tub 2 at least, such as generating of particle, will be solved, and homogeneous nearby maintenance of the substrate front face will be carried out. In addition, a wafer 3 cannot receive the environmental influence from contamination of for example, medical fluid scattering Myst or others easily because of a sealing chamber, either.

[0044] Furthermore, if a wafer 3 is supported to lengthwise (perpendicular posture), although the front face and rear face of a wafer 3 contact, the supporter material Since it is supporting with this operation gestalt so that a wafer 3 may be received from a lower part with an inclination posture, while the supporter material 41a and 41b does not contact the front face of a wafer 3 but the injury on contamination of the supporting section of the front face of a wafer 3, a blemish, etc. is suppressed sharply The portion which cannot be washed to the front-face side is also lost, there is no dryness remainder of the supporting section, and good dryness can be obtained. The surface portion of this wafer 3 is an important portion from which a semiconductor device etc. is made.

[0045] Furthermore, for single wafer processing processed for every sheet, it comes off from the front face of a wafer 3, and there is no generating of the particle by the so-called wafer imprint in which the particle which fell carries out the reattachment to the front face of another wafer 3.

[0046] In addition, although it constituted from this operation gestalt so that the processing liquid supplied in the tub might be made to overflow from the overflow effluent mouth 25 and might carry out an effluent from the processing liquid feed hopper 24 a tub, if it constitutes so that the effluent tub in which an effluent is possible may be prepared in response to the processing liquid overflowed from the depot around a depot and this depot in a member 23 In pure water washing processing etc., the medical fluid which adhered to the substrate at the time of medical fluid processing, and the matter (particle) generated by medical fluid



processing with pure water an effluent tub -- minding -- an outline -- a member -- while becoming possible to begin to pass smoothly outside and suppressing the bad influence to a substrate front face further, it is suppressed further, and growth of a natural oxidation film etc. is suppressed further and the contact to the atmosphere on the front face of a substrate can also aim at further homogeneous maintenance on the front face of a substrate

[0047] Moreover, although it was made to support with an inclination posture in response to a wafer 3 from a lower part by the supporter material 41a and 41b, you may make it support a wafer 3 into a horizontal position or a perpendicular posture with this operation gestalt. When supporting a wafer 3 into a perpendicular posture, compared with support by the horizontal position or inclination posture of a wafer 3, the supporter material will be supported so that the front face and rear face of a wafer 3 may contact, the portion which cannot be washed to the front-face side of the important wafer 3 with which a semiconductor device etc. is made may arise, or the injury on contamination of the supporting section of the front face, a blemish, etc. may produce it.

[0048]

[Effect of the Invention] the outline which was sealed as mentioned above according to the claim 1 -- a member, in order to make one substrate immersed into inner processing liquid and to perform various processings to a substrate front face While the position dependency in a tub of the etch uniformity conventionally produced with the equipment for batch processing is cancelable Generating of the watermark (silverfish) conventionally produced with the substrate processor for sheet processing can be suppressed, and the homogeneity on the front face of a substrate can be held, and it can be made to correspond to enlargement of substrate size without the injury by rotation. moreover, a substrate -- an outline -- a member -- since it is the small tub which enters only one sheet inside, while being able to attain miniaturization and \*\* space-ization -- \*\*\*\*\* liquefaction -- further, shortening of the processing time can also be attained and low-cost-ization can be attained

[0049] moreover -- according to a claim 2 -- the effect of a claim 1 -- in addition, an outline -- a member, since the depot which can hold a substrate, and the effluent tub which receives the processing liquid overflowed from this depot are prepared with processing liquid inside The medical fluid which adhered to the substrate at the time of medical fluid processing, the matter (particle) generated by medical fluid processing for example, with pure water an effluent tub -- minding -- an outline -- a member, while being able to beginning to pass smoothly by outside and being able to suppress the bad influence to a substrate front face further The contact to the atmosphere on the front face of a substrate can be prevented more, growth of a natural oxidation film etc. can be suppressed further, and the further homogeneity on the front face of a substrate can be maintained.

[0050] furthermore -- according to a claim 3 -- the effect of claims 1 or 2 -- in

addition, since a substrate attaching part can move a substrate to the lower position in processing liquid, and the upper position besides processing liquid freely in the state where it held in the longitudinal direction, a substrate is made to flood with processing liquid in the lower position, predetermined processing is performed, and it can perform delivering a substrate easily in an upper position

[0051] According to the claim 4, in the effect of claims 1-3 Furthermore, since [ in addition, ] it inclines and the substrate is supported for the processing liquid supply side so that it may become low, When making a lateral substrate immersed in processing liquid or taking out from the inside of processing liquid, while being able to suppress bending and the liquid remainder of a substrate and being able to make a liquid piece good The position dependency in a tub of the processing homogeneity conventionally produced with the equipment for batch processing can be more certainly canceled because the supplied processing liquid flows in the whole substrate front face reasonable.

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[Translation done.]

\* NOTICES \*

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1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.\*\*\*\* shows the word which can not be translated.

3.In the drawings, any words are not translated.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the \*\* type view showing the outline composition of the substrate processor of 1 operation gestalt of this invention.

[Drawing 2] Drawing 2 is the \*\* type view showing the important section composition of the wafer feeding-and-discarding state in the substrate processor of drawing 1 .

[Drawing 3] It is the \*\* type view showing the important section composition of the wafer pressure-from-below state in front of the rapid effluent in the substrate processor of drawing 1 .

[Drawing 4] It is the \*\* type view showing the important section composition at the time of the reduced pressure drying in the substrate processor of drawing 1 .

[Description of Notations]

1 Substrate Processor

2 Substrate Processing Tub  
3 Wafer  
4 Substrate Attachment Component  
5 Top Cover  
6 Carrier Robot  
7 Control Means  
21 Raw-Gas Feed Hopper  
22 42 Driving member  
23 Tub -- Member  
24 Processing Liquid Feed Hopper  
25 Overflow Effluent Mouth  
26 Exhaust Port  
41a, 41b Supporter material  
61 Hand -- Member  
62 Arm -- Member  
71- 77 and 79 a bulb -- member  
78 Reduced Pressure Pump  
80 Control Section

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[Translation done.]

**\* NOTICES \***

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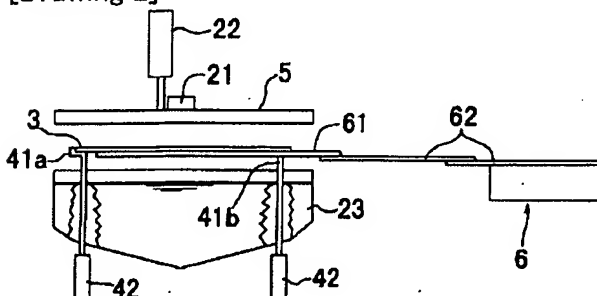
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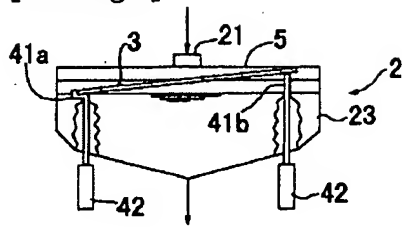
**DRAWINGS**

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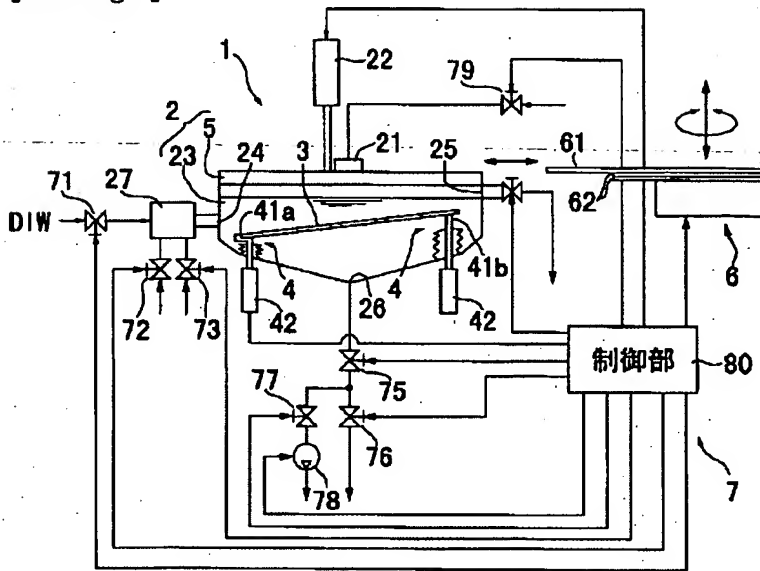
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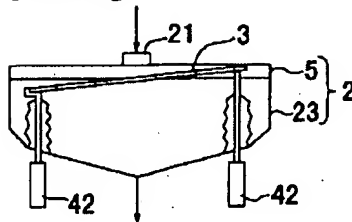
[Drawing 3]



[Drawing 1]



[Drawing 4]



[Translation done.]

**METHOD AND DEVICE FOR ROTATIONAL TREATMENT**

Patent Number: JP10242110  
Publication date: 1998-09-11  
Inventor(s): HIROKAWA JUN  
Applicant(s): HITACHI LTD  
Requested Patent: JP10242110  
Application Number: JP19970048239 19970303  
Priority Number(s):  
IPC Classification: H01L21/304; H01L21/304; H01L21/027; H01L21/306  
EC Classification:  
Equivalents:

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**Abstract**

**PROBLEM TO BE SOLVED:** To obtain even results from rotational treatment in the rotationally treating process of a platy object by eliminating the uneven treatment of the central part of a rotating shaft.

**SOLUTION:** A rotationally treating device performs cleaning and rotational drying treatment by housing a chuck 11 supported by a motor 12 for rotating substrata through a rotating shaft 11a in a port 15 and supplying a cleaning solution 14 from a nozzle 13 which the chuck 11 supporting a semiconductor wafer 10 is rotated together with the wafer 10. Since a tilting mechanism composed of the tilting shaft 17 and a tilting motor 18 which tilt the whole bodies of the pot 15 and the rotating shaft 11a of the chuck 11 at a desired angle from the vertical direction is provided on the side face of the pot 15, the occurrence of uneven cleaning and uneven drying (residual solution drops) of the wafer 10 which occurs near the center of rotation of the wafer 10 is avoided by performing desired rotational treatment while the chuck 11 is inclined at a desired angle and even cleaned and dried results can be obtained in a short time.

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